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British Association of Gas Managers.

WEDNESDAY AFTERNOON, JUNE 10.

The President read the following paper contributed by Mr. I. A Crookenden (London) on

THE DESIRABILITY OF COMPANIES EXTENDING THEIR CONTROL TO THE POINT OF CONSUMPTION.

The companies do neither themselves nor the consumers justice by stopping short of all interference at the meter, or, in some cases (as when services pass through private grounds or premises), at a point some distance from the meter. The greatest care and skill, as you know, are exercised in filling the mains with gas of high illuminating power and purity: but unless a proper supply to the nipple, and *perfect combustion there*, are secured, the maximum luminosity of the gas is not obtained. The companies, therefore, do themselves an injustice, and the consumers are unnecessarily inconvenienced and irritated.

The present plan is illogical, unreasonable, and vexatious. *Why* do we stop at the meter, and tell a complaining consumer, "We cannot investigate beyond this point; there is abundant pressure here; the fault must be in your fittings," and there leave him to remedy the defect as best he may? Is there anybody likely to know more about gas-fittings and burners, and the best means of securing effective supply to the burner, and the most complete combustion there, than we are? I think not, and submit that it is an error to leave the consumer to the expensive, annoying, and unsatisfactory remedy for defective lighting which now obtains.

But, in addition to the obligation which, I think, rests upon the companies to secure maximum light, is another consideration—*i. e., profit*—which turns, not upon gas put into the mains, but upon gas *consumed*. We frustrate, as it seems to me, the perfection of our business by leaving the most delicate part of its supervision to other and often unskilled hands, and thus *imperfectly* perform it. This is all, surely, very illogical and objectless.

I submit, therefore, to this meeting whether it would not be desirable that the companies establish a branch of "skilled gas-fitters," whose duty should be to investigate complaints, and effectually remedy defects in pipes or burners.

In the large majority of instances, I believe the expense of this supervision would be so trifling as to be not worth charging for; but, in this respect, each case might be dealt with on its merits.

I am very desirous, however, that it should not be supposed that I advocate the supplying and repairing of gas-fittings, as is the case of some provincial companies; nor do I look for any profit whatever upon the direct operation of this branch. My views are, if I may so express it, *broader*—the object, to perfect our business, relieve our consumers from a state of helplessness to which we now leave them, and thus secure mutual comfort and confidence.

Mr. Watson (Sydenham) said that, as an engineer of gas works, he thought his responsibilities were quite heavy enough already, without undertaking the charge of internal fittings. Still, he quite agreed with the writer that it was not enough, upon complaints being made, for a manager to go and tell a consumer, "Your fittings are stopped up."

Mr. Woodall (Burslem) said six months ago he sent out circulars to every consumer, informing them that, in future, the inspectors would make inquiry as to whether their burners and fittings were in proper order, and, if there was any complaint, he was to look into the matter and put it right; and that, so far as burners were concerned, he would supply them at net cost.

Mr. Craven (Dewsbury) referred to the recent explosion of gas at Halifax, and remarked that, though he should be willing to give every accommodation to the consumers in his district, he should most distinctly repudiate any responsibility as to their fittings.

Mr. Douglas (Waltham) said he thought consumers should not be left without remedy in the case of a failure in the arrangements for their gas supply, but he believed that most Acts of Parliament prohibited gas companies from becoming gas-fitters.

Mr. Warner (South Shields) said Mr. Crookenden had taken a very broad view of the question, and, in general, he quite agreed in the remarks made in the paper. The public had a right to demand a good and satisfactory supply of gas, and the plan adopted in his town was this—they interfered in no way with the business of the gas-fitters, but, when complaints were made, and the cause was ascertained, they told the consumers, "The fault is in your fittings. Go to your gas fitter, and, if he cannot give you satisfaction we undertake to do it, but it must be at your cost." In almost every instance they had succeeded in satisfying the consumer. Another matter might have been touched upon—the supply of gas from the mains to the meter, as well as the meter. In the north it was sometimes the practice to allow the plumbers to continue the fittings up to the main, which was very objectionable.

Mr. Hislop (Paisley) said he had for some years indicated the propriety of the control of the gas up to the point of consumption, for, as a rule, consumers were very ignarant in the matter, and, of course, no class of men were so well posted up as gas managers. It would cause very little trouble to gas companies to give all necessary information to their consumers, and to name the kind of burner best suited for the gas they supplied.

Mr. Paterson (Warrington) was afraid the remote consequence of the policy advocated by the writer would not be advantageous to gas companies. While conceding the point that companies should promote the interests of consumers as much as possible, and supply their little wants whenever practicable, he held it as a general principle that to lay themselves open to remedy the defects of imperfect fittings would be a very dangerous course to pursue. The company with which he had the honor to be connected had the whole of the fittings of the town in their own hands, and they carried on the business, not with a view to its becoming an element of profit, but for the convenience and satisfaction of the consumers. In all cases, however, a charge was made. There were other fitters in the town, and when their work was done imperfectly, and the consumers went to the company, they made it a point to decline any interference with bad fittings, and left it to the consumers to have the errors corrected by those whom they had first employed. But in every case where the work was originally done by the company they undertook that it should be done in a satisfactory way. In carrying out their arrangements, they had little or no trouble; but he confessed that he could not foresee what might be the remote consequence of carrying out Mr. Crookenden's suggestions.

Mr. Woodall (London) said the advantages of adopting the system were so obvious that the matter appeared hardly open to discussion. Unquestionably there was an amount of absurd folly in the way in which gas was distributed over many houses which might fairly be met and remedied by some organization of the gas company, especially remembering the large costs they were put to in order to counteract these evil influences on the part of gas-fitters. They might just as well incur the same cost with credit as have to pay it after the event, when they get nothing but obloquy. He was rather surprised that Mr. Crookenden disclaimed any wish to see gas companies becoming gas-fitters. For his own part he could see not the smallest objection to it, with the exception that, as a rule, the officers of a gas company had quite enough to do without engaging in a new trade.

The President said there was one point raised by Mr. Craven about responsibility which ought to be borne in mind. His own opinion was, that as gas suppliers they ought to do all they could to assist consumers to burn gas to the greatest advantage; but they must be careful to guard themselves against responsibility for fittings which might lead to explosion and disaster. With reference to the observations made by Mr. Warner, there could be no question that gas companies should see that the pipes up the meter were laid properly and safely, and not leave the matter in the hands of plumbers without inspection.

A new tubular petroleum lamp has been constructed by MM. Defienne. It consists of ten small circular wicks in place of one large one. They are arranged in a circle, and are attached to a frame movable by a single rack.

Chemical Repertory.

No. 119.—September 2, 1874.
EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

1211. How about Cock-roaches?—*Les Mondes* says that M. d'Havrincourt collected cockchafers at the price of a franc per 10 litres, and having destroyed them with gas liquor and sulphuric acid, obtained a good manure. A previous experiment, where the beetles were worked up with lime, gave unsatisfactory results.

1212. A Lecture Experiment.—If two or three grams of strong ammonic hydrate be poured into a glass flask holding several litres, and 15 to 20 drops of bisulphide of carbon added, in a few minutes the whole interior of the flask will be filled with white vapors. In a short time they increase so as to render it impossible to see through the flask. If the flask is kept closed the vapors remain undiminished for days. Bœttger thinks it probable that this will find some important use in optics.—*Journal of Applied Chemistry.*

1213. Utilizing Carbolic Acid.—The immersion of hides for hours in a two per cent. solution of carbolic acid, and then simply drying them, has been recently substituted for the tedious and expensive process of salting them for transportation from South America and Australia, and with most satisfactory results. Bones have been similarly treated for transportation.—*Sci. Am.*

1214. Lime Deposits in Water Pipes.—MM. Fabre and Roche point out that wherever there is a joint in water pipes, made to connect tin conduits or copper faucets, at such points carbonate of lime is most abundantly deposited. If a piece of silver be placed inside in contact with the lead pipe, it becomes covered with the carbonate in a very short time. The investigators find that all metals, electro-negative with relation to lead, are thus affected. A voltaic couple is in fact formed, and a veritable chemical precipitation caused.—*Sci. Am.*

1215. A British Mine Fire.—The fire at the Kilburn colliery has not yet been subdued, but efforts are being made day and night for that purpose, and the progress is considered satisfactory. One noticeable incident in connection with this fire has been the bringing up of forty horses out of the colliery, in which some of them had been for about twenty years. Several of them on seeing the light of day appeared to be quite bewildered and blinded, but they were not long in showing by their briskness that they appreciated the change.

1216. Instructive Experiment.—The question whether Caucasian civilization will do to tie to, was settled in the negative by a couple of noble red men in Oregon, who purchased a can of oysters and proceeded to cook them. They placed the can upon their camp fire, doing so without the precaution of ventilation. Then came a thunderbolt, and the gentle savages, oh, where were they? They would hardly have been recognized in the frightened and parboiled natives who were seen heading toward the grocery store, desperately resolved to scalp the man who had sold them a "thunderbox."

1217. Coal Consumption in Various Industries—In Prof. Lesley's U. S R. R. & Mining Register, he gives figures relating to coal consumption in Great Britain, from which we select.

	Tons in 1,000.
Waterworks	14
Chemical works	19
Railroads	20
Steamships	30
Fire bricks and glass works and lime kilns	31
Gas works	60
Mining	67
Iron and steel works	300

Regarding the iron manufacture in the United States, he estimates that it consumed not less than 18.5 pe. cent. of the fifty million tuns mined in 1873 by us.

1218. Wonderful Novelty in Gas.—To Mr. H. Courtis, in Australia, a patent has been granted for some "Improvements in Gas Purifiers," the principle of which consists in the union of four purifiers in one case with a central valve under the centre, where the corners of each of the purifiers meet. The supply and discharge pipes are so arranged that the gas is compelled to pass from one purifier to another in succession, three only being in use at one time, whilst the fourth is being cleared out and having its lime renewed. The sieves of the purifiers upon which the lime rests are kept in position by using bars of the same sectional shape as those of which the sieves are made. These are reversed in position, and fixed to the sieve bars by means of a bolt passing through them from beginning to end.

They must have curious patent laws at the Antipodes.

1219. British Gas-Patent to an Aerican.—E. E. Bean, Boston, Massachusetts.—A pneumatic electric gas lighting apparatus.—This consists of (1) an apparatus for the purpose of lighting and extinguishing gas, in which compressed and rarefied air is used for opening and closing the cocks, and a galvanic current of electricity used for the lighting of the gas; (2) in an apparatus for lighting lamps by electricity, a mechanism for making and breaking the current of electricity in the jet, thereby lighting the gas; (3) in combination with an apparatus in which compressed and rarefied air is used for the turning of the gas cocks of an electric apparatus so arranged that it will automatically transmit the current of electricity to the next lamp in succession; (4) in combination with a diaphragm and rod of a rocking lever, a spring wire, a metallic snapping wire and a metallic pole; (5) in combination with electro magnets and an armature of a catch or recess, a lever, insulated wedge, springs, and their insulated posts and wires.

1220. Improved Penknife.—"Mr. William Stamforth, designer and modeller to Messrs. Fenton Bros., silversmith, Sheffield, has ingeniously devised a knife which, so far from sacrificing utility to novelty, combines the two, and introduces a feature to which we have hitherto been unaccustomed—an arrangement for preserving the blades from dust and dirt that cannot but be contracted in ordinary use. The knife is fitted into an ornamental circular case, which, revolving, conceals it from view, displaying instead of the blades a front of pearl. When in this state of repose there is nothing to indicate that the article is a knife, and it is impossible for dirt to enter. A gentle pull and a slight turn, as simple as the opening of a pencil case, reveals the blades ready for opening in the usual manner. The contrivance is elegantly fitted."—*Iron Age.*

1221. California Fuel.—Lincoln coal is now regularly for sale in Sacramento at $4.75 per ton. To the eye it is not prepossessing, being a dingy brown without lustre. The lumps are full of cracks and there is much that looks like bony or semi-slaty coal. But the burning proves that there is neither slate nor other impurity. The ash is free from slate and clinker. We saw it in use at the Sacramento water-works. The engineer reports it excellent fuel; only it burns up rather rapidly. At Ione, forty miles from Stockton, and at Lanchs Plana, there are vast beds of similar coal, which the railway now under construction will bring to market next year. This cheap fuel cannot fail to affect the prosperity of the two cities mentioned, and it will be felt in San Francisco.—*Scientific Press.*

1222. Rinsing Bottles.—This matter we have referred to before. Fordos says that lead shot, where so used, often leaves carbonate of lead on the internal surface, and this is apt to be dissolved in the wine or other liquids afterwards introduced, with poisonous results; and particles of the shot are sometimes inadvertently left in the bottle. M. Fordos states that clippings of iron wire are a better means of rinsing. They are easily had, and the cleaning is rapid and complete. The iron is attacked by the oxygen of the air, but the ferruginous compound does not attach to the sides of the bottle, and is easily removed in washing. Besides, a little oxidised iron is not injurious to health. M. Fordos further found that the slight traces of iron left had no apparent effect on the color of red wines; it had on white wines, but very little; and he thinks it might be better to use clippings of tin for the latter.

1223. Baby Poison.—The Brooklyn Board of Health has found it necessary to enact as follows:

Whereas, Frequent complaints have been made by the press and the people that terra alba (which is nothing but plaster of Paris or gypsum), lamp-black, sulphur, aniline, verdigris, Brunswick green, gamboge, smalt, ultramarine, oil turpentine, prussic acid, rotten cheese, fusel oil, chrome yellow, and other drugs and compounds are largely used in the manufacture of cheap candies; and,

Whereas, The indiscriminate use of such poisons, drugs, and compounds is considered deleterious to health;

Resolved, That the Sanitary Committee, or such officers of this Board as they direct, thoroughly investigate and report to this Board as soon as possible the mode and material used in the manufacture of all descriptions of wares and merchandise made and sold by confectioners in order that the children at least may be protected from the evil effects of the dangerous compounds sold under the description of candy.

1224. Gas Pressure Alarm.—When two neighboring buildings are illuminated by gas derived from the same source, it frequently happens that the extinction of the lights in one building causes the pressure of gas in the other to become greatly increased, and sometimes to result in accident. M. Launay proposes as an alarm to give warning of this over-pressure, a bisulphate of mercury battery, in which the liquid is in communication with the gas by means of a siphon, so that the pressure of the gas in varying, raises or lowers its level. If its pressure is above a certain fixed limit, the liquid is raised so as to come in contact with the metallic portion of the battery, establishing a current which sounds an electric alarm. M. Launay also suggests that a simple method of determining leaks in gas pipes throughout a building is to force some strongly odorous smoke into the supply pipe. The fumes of incense, for example, escaping in any room, would be readily distinguished from gas, and the locality of the leak quickly found.—*Scientific Press.*

1225. Ornamental Gas Fixtures.—In an article on the modern utilization of ancient works of art, one of our New York dailies says:

Formerly a gas pipe was nothing more than an ordinary tube of iron, and it might, in anticipation, have been very difficult to see what connection was possible between such a simple device and costly works in bronze, long fondly cherished by the nations of antiquity. Yet to day in New York there is a capital, estimated at $2,000,000, invested in the manufacture of what is popularly known as "gas fixtures"; and the number of workmen employed is about 1,500 in this particular branch of the business. New York excels every other city in the Union in this respect though we have here less than half a dozen manufacturing establishments of any magnitude, including Mitchell, Vance & Co., (Mr. Vance, chief partner, President of the Board of Aldermen), Archer & Pancoast, Fellows, Hoffman & Co., Bradley & Hubbard, of Meriden, Conn.

1226, PANCAKE FIRE-ROCK.—In the early days of smelting in Eastern Nevada, it was found necessary to find a substance for lining purposes which would resist the intense heat required in smelting, and the Pancake sandstone was the result of explorations to discover the same. Since that time fire brick has been imported from St. Louis, Philadelphia and other points with which to line up furnaces, but after a short trial, it was found that nothing would so well fill the bill as did the "Pancake."

Report on Gas-Purification.

By PROF. HENRY WURTZ.

[Concluded from page 66.]

DETAILED DESCRIPTIONS OF THE TWO METHODS, AS USED BY THE TWO COMPANIES.

1. The Iron Process of the New York Gas Company.

This is founded upon a patent recently issued to Messrs. St. John and Cartwright, and consists in the use of an admixture of a native hydrated iron-oxide (a common limonite ore), turnings or borings of metallic iron, and charcoal.

It would appear that this mixture is susceptible of usage without sieves or gratings; doubtless owing to the coarseness of the granulation of the material. Any advantage gained hereby, however, must be necessarily at the expense of efficiency, as regards extent of absorbent surface. Indeed, the general statement is made with regard to the iron process, that "a much larger surface is requisite than with lime, under equal velocities of current" (Clegg, p. 199.)

2. The Lime Process of the Manhattan Gas Company.

Under this head, Mr. President, I have to describe what I cannot but view as the most valuable practical improvement in gas purification that has been made in more recent times. This improvement may be set forth as follows:

After the purification of the gas in the ordinary "dry lime" apparatus, the foul lime, just as it remains in the purifiers, is revivified therein by the method of "ventilation," known as that of Palmer (specified in his patent of April 17, 1847, as "the using of atmospheric air to be blown through the lime purifiers before they are opened for the removal of the refuse lime"). As practised by your company, the ventilation is effected by drawing air from above downwards through the fouled purifiers; but the special and novel improvement I refer to resides in a supplementary device, which is simply the passage of the foul effluvia from the revivification through a secondary dry-lime purifier.

In the last edition of Clegg, in referring to Palmer's method (p. 188), it is remarked that "This plan of neutralizing the refuse, and thus removing the objection to the purification by lime, has not yet been sufficiently appreciated, and it is capable of being worked out with further advantage"—a judgment of the acute editors of that work which has been remarkably verified by the actual achievement of your company.

Further, in relation to this, under the next head.

OBSERVATIONS MADE UPON THESE TWO METHODS, AS ACTUALLY PRACTISED BY THE TWO COMPANIES.

The especial object and occasion of the institution of this investigation having been to settle the highly important questions that have arisen—as to whether either, or both, or neither, of these two prominent methods of purification lead, in practice, to the propagation or diffusion of noxious effluvia throughout the densely peopled neighborhoods in which these great manufacturing establishments are located—of course nothing else could be half so conducive to the proposed result as careful examination upon the spot, in each case, of the actual working results. Such examinations were accordingly made, both at the works of the Manhattan gas company, and of the New York gas company, with the care and deliberation demanded by the momentous nature of these questions.*

* Several gentlemen, experts in these subjects, accompanied me in these examinations; but it has been deemed preferable that my own conclusions should be stated, apart from those that may have been reached by others.

The absolute necessity of such renewed examination of questions which, it would seem, should have been long since settled; will appear on consideration of the opposite opinions entertained by the most recent and most esteemed authorities. Thus, compare the two following passages:

"The sulphuret of iron, when removed from the purifiers and exposed to the air, emits no odor, whilst the sulphuret of lime is readily decomposed, and produces an abominable smell."—(Last edition of Clegg, 1866, p. 187.)

"The vapors of hydrocarbons are much heavier than the atmosphere, and when evolved from the foul oxide (of iron) by the heat of chemical action, they float in the lower stratum of the atmosphere near the surface of the earth, and produce extensive annoyance. There are few smells more offensive to many persons than the smell of these compounds, given off by the oxide in the process of revivification; and in every gas-works they ought to be consumed instead of being allowed to escape. If this be not done voluntarily, the law ought to compel it."—(Rev. Mr. Bowditch on Gas, 1867, p. 22.)

It is scarce necessary to remark upon the internal evidence in these two quotations, that the former covers merely a loose and general statement, founded upon hypothetical and partial views; while the latter is circumstantial and plainly based upon actual observation of facts. I am constrained to state that my own observation, so far as the natural capacities of my mind and senses extend, bears out the positive assertions of the Reverend Mr. Bowditch, in the latter paragraph.

I was present during a part of the time (usually extending to eight hours,) occupied in the discharge of the effete material from one of the iron purifiers, containing the mixture, as stated above, of iron ore, metallic iron and charcoal; and, although the wind was very high at the time, and the effluvia were chiefly swept away at once over the East River, it was still not difficult to recognize the insufficiency of the operation.

The fouled oxide was spread out over the floor of the purifying house in layers of a foot or more in thickness, and underwent there a sort of fermentation or internal change, accompanied by a rapid rise of temperature of the mass. A thermometer placed in a portion of the material which had been taken out about an hour previous, rose at once to 110° F., the air at the time being 82°. Hence the volatile ingredients and products were being rapidly expelled. The odors evolved were very strong, but in the immediate vicinity it was not easy to distinguish any other odors than those of naphthaline and ammonia, which overpowered all others. Remembering, however, the peculiarly persistent character of the foul odor which is complained of so greatly, and how it is observed to spread very often over large portions of the city, and to be carried by the wind for miles, with but little loss of intensity; I made my observations at such a distance from the purifying house that the naphthalic and ammoniacal smells were no longer distinct. I am obliged to say that I then caught repeatedly, and recognized beyond a doubt, the peculiar and characteristic stench with which the people of New York and vicinity are unfortunately so familiar.

The phenomenon here encountered, of the complete masking of an odor so repulsive and nauseating a nature, by other odors; which, like those of naphthaline and ammonia, are of an agreeable nature, and highly stimulating to the nervous system (belonging, in fact, to the class of perfumes), is one that will be familiarly recognized by chemists. In fact, the art of perfumery itself is founded upon this very principle.*

When impure gas diffuses into the air, it may be asserted, from thoroughly known general chemical principles, that the odors of hydrosulphuric acid, hydrosulphates, and bisulphide of carbon must quickly be destroyed by reactions with the free oxygen (or ozone) and moisture, and that of the ammonia by conversion into the inodorous solid bicarbonate. The naphthaline odor becomes enfeebled by dilution, so as to be imperceptible; but as regards the peculiar unknown substance which diffuses itself from the foul purifiers when opened, it seems to be susceptible of comparison only with that remarkable class of odors exemplified by the emanations from musk and from the skunk; which, so far from being rapidly enfeebled, like most smells, by aerial dilution, appear to be actually developed and intensified thereby; and to be almost indestructible by natural atmospheric agencies.

* A precisely parallel case is presented in the common mode of testing samples of alcoholic liquors and spirits, by rubbing a few drops upon the skin of the hand; by which the vilest and most nauseating smells are frequently brought out, through the dissipation, by the heat of the hand, of the alcoholic odor which had masked them before.

It seems likely that these troublesome substances belong to the class of impurities designated on a previous page as "sulphuretted substitution products," but no chemist has as yet given to the subject the attention necessary to throw any reliable light on this point.

In the examination of the modes of operation of the Manhattan gas company, the process was watched throughout all its stages; visits being made to the purifying house at the beginning of the operation of cleansing out the ventilated and revivified lime; also, to the repurifier through which the effluvia are passed, at all stages of its action. The observations made were as follows:

It was found that beyond question the method of Palmer, of effecting the revivification or "ventilation" of the effete lime in the closed and confined space of the purifier itself, causes a concentration of the heat, and a rise of temperature; by virtue of which not only is the revivification greatly accelerated, but the chemical changes occurring in the mass most beneficially modified, in so much that the action of oxidation is much intensified, and more or less combustion is effected of the sulphuretted and other compounds, otherwise so offensive and unmanageable. Still, it would appear that this alone is not found to be sufficient; and many attempts have been made, both by the Manhattan company and by others, to make this combustion complete, by passing the fumes produced during the ventilation through fire; but the occurrence of destructive and dangerous explosions has enforced the abandonment of this plan.

It is here that, in your modes of operation, has been brought in the new and valuable idea of continuing or repeating the process of Palmer upon the mixed air and fumes, by passing the same through a supplementary purifier charged with hydrate of lime. Examination showed that in this secondary apparatus an important rise of temperature occurs also; accompanied by powerful chemical action, indicated by an abundant evolution of vapors of phenol or "carbolic acid," with naphthaline and ammonia, and an entire disappearance of the peculiar and persistent stench which has been the cause of complaint; so that at a little distance on the lee side of the supplementary purifying chamber, or of the effete mass after removal therefrom, the only perceptible odor was of a phenolic character.

It is true that the delicate test, lead-paper, still answers in the air of this chamber, to a trace of sulphur; but it has been shown by the Rev. Mr. Bowditch (on coal gas, London, 1867,) that there are sulphur compounds which may exist in gas in traces, and which are capable of staining lead-paper, and which, nevertheless, are not susceptible of absorption by lime and other substances possessed of the strongest affinities for sulphur in most forms (peroxide of iron being particularly mentioned).

THE SULPHATE OF AMMONIA WORKS.

In immediate proximity to the works of your company, Mr. President, there is an establishment for the working up of your foul ammoniacal liquors into the form of commercial sulphate of ammonia. During my most recent visit, this happened to be in full operation, and the intensity and foulness of the stench proceeding from it was beyond the power of words to describe. The process consists, I believe, simply in passing steam, charged with the ammoniacal gases

and other volatile matters of the liquor, into sulphuric acid. The ammonia is, of course, chiefly absorbed; and the sulphuretted and other constituents which have been condensed from the gas are, of course, set free into the atmosphere,

"To sport on the breeze,
Like a butterfly gay."

At that time the wind blew strongly from the North River directly over the city; and these vapors and gases, which apparently, and indeed necessarily comprehend a concentration or quintessence of all the foul matters of the crude gas, were being most effectively diffused throughout the air of the most populous portion of the Metropolis.

I may add that in the ammoniacal liquor itself, these stenches are masked by ammonia, etc.; and, in fact, the same phenomenon was observed here as at the New York gas works, namely, that the odor was less characteristic and offensive close to the ammonia works than at some distance in the direction of the wind. Those who have experienced the peculiarly nauseating effects of the odors emitted by the cauldrons of heated coal-tar pitch used in laying the wooden pavements in vogue at the present day, may realize, though on a much smaller scale, the character of the effluvium which pours in torrents from these sulphate of ammonia works.

CONCLUDING REMARKS.

There is no disputing the fact, of which the evidence is rapidly accumulating, that the tendency of progress founded upon the teachings of experience, among gas managers, is in the direction of a return to the use of lime for purification; unless some great and indisputable improvement shall be introduced, increasing greatly the efficiency of the iron process.

The recent literature of gas could be largely quoted in support of this assertion. In fact the only advantage of the iron process, and the one which led to its adoption, in most cases where adopted, was no conviction of superiority of any kind over lime; but a matter of mere convenience, being solely the incidental circumstance, in the case of large urban gas works, of the difficulty of getting rid, in cities, of so large a mass of the fouled lime; and inasmuch as it was found that the iron oxide could be revivified and used over and over again many times, this difficulty did not apply, to so great an extent at least, to the iron process.

Bowditch, commenting on this, says (p. 29:)

"Some engineers in towns, especially in London, are frightened at the thought of having to remove lime which has purified gas. Their fears arise from experience relative to ordinary gas lime, which evolves most offensive compounds on exposure to the atmosphere."

It is obvious that all such fears have no longer any real foundation; in view of your perfected mode of deodorizing the fouled lime, and depriving it of all offensive matters.

It has been held that the panacea for all the ills of the iron process consists in the addition of a lime purifier thereto. The report of Messrs. Torrey and Schultz, however, which is quoted above, shows that the absorption of illuminating ingredients by such second purifier, and the impoverishment of the gas, would more than neutralize any possible benefit.

Bowditch favors another plan. He says (p. 21):

"The evolution of the sickening vapors emitted by foul oxide (of iron) need not be a source of annoyance, as the oxide can be revivified in the purifiers themselves, etc."

This does not seem to promise benefit; unless, indeed, the additional device of your company were used here also, and the effluvia from the revivification in this way of iron oxide in the purifiers themselves, were deodorized again by a lime purifier. Bowditch himself, seeing the difficulty, proposes to burn these effluvia; but here the danger of explosion steps in again. Besides this danger, revivification of foul iron in the purifiers seems likely to be impossible, from another cause; namely, that if the revivifying iron sometimes becomes red hot in the open air, as is well known, the heat engendered in the closed purifier would, without doubt, accumulate so as to become wholly unmanageable; and sulphurous acid gas would surely be generated in quantities; thus, what is now possibly but a nuisance, and not certainly known to be deleterious, would be converted into a recognized poison.

Discussion of the interesting modifications that have been proposed by Laming, Graham, and others, would lengthen this report too much; and the more especially, as the practical and inevitable conclusion from the whole investigation and discussion is, that the Manhattan Gas Company could scarcely do better than now, so far as the questions apply, of efficient purification, and avoidance of production of nuisances thereby.

It has been suggested that even the residual odors of ammonia, naphthaline and phenol, and the traces of sulphur found on the final issue of the fumes from the secondary purifier or deodorizer, might be removed by placing a small scrubber or condenser at the tail of the whole apparatus. The estimation in which phenol is now held, however, as an actual disinfectant, might suggest some hesitation in thus preventing its final escape into the atmosphere of our filth-infested Metropolis.

CLOSING SUGGESTIONS.

I have to suggest that, in my view, it might be regarded by some as desirable, in order to complete the case, and fully to demonstrate the position taken by the Manhattan gas company:

To institute a thorough chemical investigation of the changes and metamorphoses that take place, and the products that form, in the processes of ventilation and deodorization; thus establishing the theory of the new improvement.

To endeavor to find some mode of preventing or mitigating the nuisance, which would appear to proceed indirectly from the gas, through the sulphate of ammonia manufacture. This might probably be accomplished with ease, by the application of some chemical and practical skill.

[This Report dates some time during the summer of 1868, but the exact day seems to be not recorded. —EDITOR.]

A Century's Progress in Chemical Theory.

By Prof. T. STERRY HUNT, of the Massachusetts Institute of Technology.

[Were not the first rank in Science already conceded to Prof. Sterry Hunt, his recent address on the above subject to the conclave of American chemists at the late Northumberland Centennial, would alone have demonstrated his title to this rank. The following very brief abstract is stated to have been sanctioned by Prof. Hunt himself, and therefore gives an idea, though a faint one of course, of the matter and scope of this profound essay.—ED.]

Prof. Hunt traced the progress of chemistry as an art from the earlier times, and endeavored to show how it took form as a science in the eighteenth century, beginning with the labors of Becker and Stahl. He defined the phlogistic hypothesis of the latter, and then proceeded to notice the three great chemists who one hundred years since began a new era. These were Scheele, Priestley, and Lavoisier. Of these the first two were great experimenters, but failed rightly to interpret their discoveries. Priestley, though he had made known the existence of oxygen, still held to the old philosophy, and died the last defender of the phlogistic hypothesis, to the downfall of which his discovery had so much contributed. The third of this group of chemists was Lavoisier, who seized with a marvellous comprehension the true significance of the facts made known by his contemporaries, greatly enlarged the field by his own researches, and, another Newton, showed the grand harmonies which govern all the changes of matter in the mineral, animal, and vegetable kingdoms. Lavoisier justified, by the aid of the balance, the old doctrine of Hermes that in the changes of matter nothing is lost and nothing gained. He, with Wenzel, made chemistry a quantitative science, and the great laws of definite and multiple proportions made known by Dalton showed that all things were "ordered by weight, by number, and by measure," a principle further illustrated by Gay-Lussac's discovery of combination by volumes. The history of organic chemistry, the theory of types, the great law of homologous series, and of substitutions, were then illustrated, and the theory of compound organic radicals defined. The question whether there exists a simple ratio between the equivalent weights of the elements, raised by Prout, who supposed them all multiples of that of hydrogen, has been considered by Dumas, who had shown that they are probably multiples of a number one fourth that of hydrogen. From the remarkable numerical relations between the equivalent weights of related elements Dumas and others had drawn conclusions favorrble to the compound nature of these bodies, curiously confirmed by studies of the wave-lengths of their spectra. The question of the transmutation of the elements thus raised the speaker considered to be beyond the domain of our terrestrial chemistry, yet he ventured to infer from the augmenting complicity of the spectra of the stars, as Clarke, and after him Lockyer, has done, that a process of condensation in nebular matter may generate from the simpler gases the metals and the metaloids.

The great principle of the dissociation of bodies by heat so well studied by Grove and Deville here comes in. The speaker ventured to inquire whether the highly attenuated matter, which in the solar chromosphere gives a green spectral line distinct from that of any known terrestrial substance, might not, perhaps, be that body more elemental than hydrogen, whose existence we may conjecture from the fractions in equivalent weights. This, however interesting as a speculation, belongs to the chemistry of the future. The speaker then alluded to the phenomena of polymerism and its application alike to compound bodies and to elements like phosphorus and carbon, as well as to compound mineral species. He enlarged upon the beautiful researches on diffusion as giving us a glimpse of the delicate and subtle chemistry of organized structures, wich in connection with modern synthesis is serving to afford clearer notions of vital chemistry. In conclusion he spoke of the essential nature of chemical changes. The processes of chemistry belong to a higher plane than those of physics, and all attempts to elucidate chemical phenomena from the latter are necessarily but imperfect and often misleading analogies. In chemical union the impenetrability of matter is seen to be no longer a fact, and all the physical and physiological characters fail us except that of gravity. Can we go forth then to assert with Hegel that chemical union is identification, and to declare that it finds its type in solution? We may endeavor by hypotheses of atoms and molecules to render more intelligible the great laws of equivalent and multiple proportions which govern chemical changes, but let us not confound the image with the theory itself until, in the language of a great modern chemist, "we mistake the suggestions of fancy for the reality of nature, and cease to distinguish between faction and fact." The atomic hypothesis in chemistry, like the Newtonian theory of light in optics, has done good service in the past and is inwrought in our teachings of tod-ay, but he believed it would not retain a place in the chemistry of the next century, to which Brodie has already pointed the way in his calculus of chemical operations.

Coke Ovens.

Mr. William Clapperton of Glasgow, Scotland, has lately made some inquiries into the workings of various sorts of coke ovens, the facts being all obtained from manufacturers, and representing the results of actual work. He found that in an English establishment 1,362 tons of coal were put into 323 bee-hive ovens, and 444 tons, 8 cwt. of hard coke and 139 tons 1 cwt. of soft coke were obtained. The total, 583 tons, 9 cwt., is barely 43 per cent. of the coal. A Belgian manufacturer, Mr. Perrott, informed him that he obtained better results, namely 52 per cent., and Mr. Clapperton therefore assumes the average performance of the bee-hive oven to be a yield of 50 per cent.

As to the Coppee ovens, Mr. Vandenkerckhoven, another Belgian manufacturer, used charges of 5,000 kilograms (or 5 tons) of coal and drew 3,800 k., (or 3 tons 16 cwt.) of coke, obtaining a yield of 76 per cent. Mr. Perrott, however, reported his return from similar ovens and coal at 70 per cent.

Mr. Clapperton compares the two systems of coking in other respects. Mr. Perrott, who has both ovens working together, says the cost in the bee-hive is 1s. 8d. (English) per ton and 1s. in the Coppee. As to time, a bee-hive oven worked 81 cwt. of coal per week, and the Coppee worked 5,000 kilograms in 48 hours, or about 175 cwt. per week. One reason for this striking difference in time is that 2½ hours are required to draw the coke and make a new charge in the bee-hive; while the Coppee is discharged and charged in 8 to 10 minutes. The difference in the labor account is very great. In regard to space, 10 beehive ovens cover 1,320 square feet, 10 Coppee ovens, 1,060 square feet, and 10 Appolt ovens cover 280 square feet of ground. This gives a treatment in 24 hours on 100 square feet, by the beehive of about 980 lbs. of coal, and by the Coppee of 5,190 lbs., or a product per 100 square feet and 24 hours, by the beehive of 490 lbs. coke, and by the Coppee of 3,633 lbs. coke. The comparison of cost has to be made on a

double basis. In England 12 beehive ovens would cost £540 and 12 Coppee ovens £1,248. But allowing that the 12 beehive ovens produce 3 tons of coke per 24 hours, 2 Coppee ovens costing £108 would do the same work.

Of course, comparisons of this kind must not be drawn too fine. But there is no doubt, that the Belgian oven is in most cases the most economical in original cost, (calculated on a given production,) running expenses and quality of product. These are advantages which must appeal to almost every manufacturer of coke and it is worth while to ask why the use of these ovens does not increase in every quarter. It is certain they have been tried in a great many districts without making that headway, which is to be expected from their great theoretical superiority. The reason for this seems seems to be partly prejudice, with some basis of truth. In the beehive oven the coal is heated entirely from above and the coke comes out in pieces, which are as long as the mass of coal was thick. In the Belgian oven, on the contrary, the coal is heated on all sides, and though the mass of coke has a columnar structure, the columns are shorter, and in breaking up the pieces are smaller. Probably this is not so economical a fuel for the iron master's use as the very large lumps from the beehive, which lose less in transportation, and give a more open column in the blast furnace. But the difference cannot possibly be equal to the great saving in coal, labor, and time which the Coppee oven effects. In fact the defects of the coke from the Belgian oven seem to be exaggerated. It is of excellent quality and must certainly give as open a charge in the blast furnace as anthracite coal. The only real defect that has been fairly proved is the loss in the small coke, and this does not seem sufficient to neutralize the economy of its manufacture.

We would be glad to receive from our readers their experience in the comparative use of these two forms of oven. In one case a number of Belgian ovens were built by an American furnace man at a cost of $500 each, and did excellent work. No complaint was made of the coke but, on the contrary its quality was so good that the furnace was materially increased, and at the same time the return from the coal was much higher.—*Eng. and Min. Jour.*

Gas Wells in Illinois.

About three miles from Mattoon, Illinois, is a gas well which furnishes its owner with thousands of cubic feet of light and fuel. The well is on the Champion farm, and is just back of the house in which Mr. Champion and his family live. Two years ago Mr. Champion began boring for water. After sending his drills down forty feet or more, no sign of water having been reached, he drew them out intending to bore somewhere else, but as the last section of the drill left the hole which had been made, up rushed a stream of carburetted hydrogen gas with a roaring sound that was heard more than five hundred yards away. The air was filled with the stench for several days as the malodorous fluid came pouring out in a seemingly exhaustless volume; but at the suggestion of one of the many hundreds who had been attracted to the spot, a wisp of lighted straw was applied to the current, and very naturally, in a few moments the atmosphere was purified. But the contact of fire with the rushing gas resulted in a loud explosion that startled the neighborhood, and when the wide-spreading sheet of fire which for a moment stretched above the heads of the bystanders had disappeared, there was seen shooting upward to the height of thirty feet, a column of fire two or three inches in diameter. This immense gas-jet was visible to residents of towns five and six miles distant from the well, and was the subject of much wonderment, of course.

It was two or three weeks before Mr. Champion thought seriously of utilizing the gas works which nature had so thoughtfully established righa at his door. He sent for a plumber and had gas fixtures put up in every room in his house. Then he ran pipes into stoves and fire-places and grates, and having laid a main and sunk a two-inch pipe into the mouth of the gas well he made the necessary connection, filled in around the opening of the well with clay and earth, and was now ready to put to practical test the great gift so unexpectedly received from the under world. He lit the gas in his parlor, his bedrooms, and his kitchen, and was delighted. It burned with a clear, white flame, and gave forth neither smell nor smoke. He turned it on in grate and fire-place and stove, and touched a match to the out-flowing currents. The result was more gratifying than he anticipated. In a few minutes the coldest rooms were nicely warmed, and the stove was hot enough to brown the stoutest roast.

Since that time there has been a never-ceasing flow of gas. Mr. Champion has purchased no candles, no wood, no coal, from that date to this. He has run no risks from defective flues or kerosene oil explosions, and smokey chimneys in his house are an impossibility.

A short distance from Mr. Champion's farm lives a Mr. Dole, who has just struck gas on his place. The well which he has opened is almost as strong as Mr. Champion's, and it has been proposed that they should combine the forces of the two wells, form a stock company, and supply Mattoon and the surrounding villages with gas.—*Exchange.*

Coal Economy at Woolwich, England.

The Royal Gun Factory at Woolwich has been for some time past conspicuous for its efforts to economize fuel, both for steam and manufacturing purposes, and it is now possessed of a novelty in furnaces, in which the economy of fuel is a striking feature. It is at present applied both to reheating and puddling, and its consumption of fuel and yield of iron taken with scrupulous accuracy. The saving of fuel is over a period rising to six months an average of 40 per cent., while the saving in fettling in the puddling furnaces is scarcely less remarkable. The durability of the furnace is also much greater, and the provision against an excess of free air, the pestilent source of waste in the iron trade, is peculiar and effectual in saving iron, whether in reheating or puddling. The plan on which the furnace is constructed is to provide an ordinary furnace with an upcast at the rear of the existing combustion chamber, and in contact with it. The products of combustion from the furnace are led into the said upcast by passing either over, under, or around the body of the furnace. In the upcast is placed a conical cast iron tube in a vertical position, and between the sides of which and the upcast are spaces for the free circulation of the products, the heat of which is taken up by the cast iron vessel or tube. This tube is fitted with a hopper at the top, and check dampers, by which the fuel is let into it without the intrusion of air. Its capacity is equal to containing 12 cwt. of coal, which is kept up by regular charges of about 2 cwt. Its temperature is usually at a bright red heat, and as the fuel descends it is freely rarified. It is provided with an outlet into the combustion chamber, through which a constant stream of carburetted hydrogen is passing over the fuel on the fire-bars, taking up the free air passing through the interstices of the fuel, and arresting their wasting action in the furnace. The remainder of the fuel that becomes coked is passed by the same channel on to the fire-bars coked and hot, so that no cold fuel passes into the combustion chamber. The amount of heat thus carried back into the furnace, and which is the the great economizer, can be partially estimated from the fact that in place of the waste gases passing off at some 3000 deg., it does not exceed 500 deg. as they escape into the stack beyond the region of utility. These furnaces are not complicated by mechanical aids, the combustion being carried on by in-draught. They are easy of adaptation to existing plant, incur but a trifling expense, and give great durability to the bricks, being free from the chemical action so common to furnaces of less perfect action. The present puddling furnace has yielded 250 tons of iron—the work of an ordinary furnace—and is far from its termination. Here one of the wants so urgently pressed upon our attention by ironmakers seems to be met, where the elements of profit are patent, and free from sources of obstruction that have been a common bar to many schemes.—*Iron Age,*

British Peat-Experiments.

A company is organizing in London for the purpose of working extensive fields of peat in the Highlands of Scotland. It is proposed to use the Clayton process, by which the fibre of the peat is thoroughly cut up and converted into a dense pulp, which, when dry, becomes a solid mass at hard as oak.

PEAT PATENTS.

Christopher Brakell, engineer, of Manchester. Improvements in drying peat, in peat fuel, and its application to reduction of iron ores; and includes improved machines for macerating, comminuting, and mixing together the constituent particles of crude peat, as removed from the bog, and for preparing it for the drying process; also improved stoves, or drying chambers, by means whereof the process of drying the peat so prepared is effected with the minimum consumption of fuel and power; and, finally, an improved process of smelting iron ore with the aid of such peat-fuel, which consists in pulverising and crushing the ore into minute fragments, and commingling it with the peat-fuel, so as to form blocks, which, when charged into the furnace, smelt speedily, considerable economy of fuel being thereby attained. *Iron* says, "We regard the principles of this process —namely, the comminution and commingling of the ore and the peat-fuel—with considerable favor, and deem it to be rich in promise for the future of iron-making."

Another invention relating to the utilisation of peat as a combustible proceeds upon a different principle, namely, the preliminary carbonisation of the peat, similar to the conversion of coal into coke. For this we are indebted to Mr. D. Kinnear Clark, civil engineer, London.

Another is claimed by Mr. Wolffrain, mining engineer, of Blackheath. Crude peat as taken from the bog, after being pulped in a mill or apparatus specially constructed for the destruction of its vascular structure, is moulded into suitable blocks, which are removed to a shed or drying-house; atmospheric influences are relied upon for the initial stage of the drying process, which is subsequently accelerated by transferring the blocks into a gradually increasing artificial heat, so that the pores close up gradually, and the free moisture is finally yielded up under the rapid action of superficial evaporation, stimulated by heat. —*Iron.*

Public Lighting in Paris.

The examination of the public lamps of the city of Paris will lead to an improvement which is shortly to become of general adoption. Consequent on the interesting experiments made, in 1862, by MM. Berard and Audouin, under the direction of MM. Dumas and Regnault, the Parisian authorities have replaced the old burners by an iron bat's wing of uniform size, having a slit 0·6 millimetre in diameter, and consuming 1·40 litres (five cubic feet) per hour, this form having been found the best of any that has yet been experimented on.

They have recently experimented on the steatite jet adopted for gas lighting at Vienna, and known in Germany under the name of "Spaarbrenner," or "Economic jet." Comparing this with the ordinary "bat's wing," much employed for public lighting in Paris, the following results have been arrived at.

On regulating the Paris burner for the consumption of 140 litres per hour, it was found that the Vienna burner gave the same lighting power with a consumption of only 120 litres, showing an economy of 6·1 per cent. In regulating the two jets, so as to consume each 140 litres per hour, the Vienna jet gave a superior lighting power of 6·6 per cent. over the Parisian.

The Parisian jet burns under a pressure of 2·7 millimetres (0·1063 inch), while the steatite Vienna jet burned under a pressure of 3·5 millimetres (0.1378 inch). Consequent on these results, it was resolved to adopt the German jets in three thousand lamps in Paris.—*London Journal of Gas-Lighting.*

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—Ed.

Results with the Gibson Valves.

[We are requested to publish the following correspondence, a request to which we accede with pleasure.—Ed.]

Office Amer. Coal Gas Light Imp. Co.,
42 Pine St., New York, August 20, 1874.

Joseph W. Beatley, Esq..
Engineer People's Gas-Light Co.,
Brooklyn, N. Y.

Dear Sir: Will you do me the favor to communicate to the Editor of the Gas-Light Journal, an official statement of the benefit that have been derived by your company from the use of the ninety valves of Gibson's patent of September 19, 1871, that were fitted up at your works last year.

I quoted the general average of gain by their use at your works in February last, to the Convention at Cleveland on 13th May: but to settle the question of their efficacy in continuous ordinary working, I desire to further state to such engineers as may be interested in the subject, the results obtained by you during the past nine months. Very truly yours,

Wm. H. Grenelle, Special Agent.

Engineer's Office of
The People's Gas-Light Company,
Works Foot of South Eleventh Street,
Brooklyn, L. D., August 27, 1874.

Mr. Editor: In compliance with Mr. Grenelle's request, I take great pleasure in sustaining the report that he made at Cleveland as to the use of the Gibson Valves at these works, and in confirming its general statement of value by special detail.

In February last with two benches less in use, and carbonizing 17 tons of Ritchie mineral and 35 tons of Westmoreland coal less in same benches of retorts than in February 1873, the make was an increase of 300,000 cubic feet of same average candle power, giving an increase of yield of 10 per cent per ton of coal, and in average yield per retort used, making an aggregate earning of about 24 cents per 1000 cubic feet on the monthly production. When, however, the valves are used to aid in the combination of naphtha and coal gas, the facility they afford in the production of a large increase of coal gas at a low candle power, makes them indispensable in the manufacture of such commercial gas.

The prevention of the formation of carbon in the retorts, to which special attention was called at Cleveland, by the exhibit of specimens of scale or papyrocarbon sent by me, is one of the great advantages obtained by the use of the valves. Carbon no longer penetrates the clay retorts, but the little that forms in scales is easily detached and removed by a charge of wet coal, the scale falling, and the retort left clean when the charge is drawn.

It is much more satisfactory to exhibit the condition of the retorts at time of charging, than to make statements, or to correspond, in regard to their condition, and I shall be most happy to show them to any of my fellow engineers, who may become interested in the subject. Very respectfully yours,

Joseph W. Beatley, Engineer.

British Patent: Gas-Light Kindling.

A new automatic method of turning on, igniting, and extinguishing gas-lights, wherein the supply and pressure of the gas itself, by excess or defect, is the sole active agency, is the joint invention of H. Green, gas engineer, of Preston, and J. Barrow, manufacturing chemist, of West Gorton, Manchester; who claim improvements in effecting the ignition of gas, and in apparatus and means for opening the supply of gas to burners, for igniting the gas, and for extinguishing gas-lights. They apply to each individual gas jet, burner, or lamp, a small elastic or expansible and collapsible vessel or channel, so arranged and connected as to actuate a suitable tumbler or lever, whereon is carried a cup or vessel of mercury, or like suitable sealing fluid, arranged to effect, as required, the opening or closing of the nozzle or orifice of supply for conducting the gas to the burner.

In order to obviate any difficulties from the fluctuation of pressure usual in gas mains, the elastic material is so arranged and constructed as that it opens out or expands only when subjected to a pressure greater than the maximum ordinarily prevailing in the mains; when that maximum is exceeded, the vessel by expanding causes the tumbler-lever to unseal the orifice of admission, permitting the gas to issue; while at the same time it actuates suitable apparatus for igniting the gas. The vessel then partly collapses, on the reduction of pressure, but not so far as to close the gas orifice, being arrested and securely retained in suitable position, leaving the nozzle or orifice communicating with the burner open, until the extra pressure is again put on; whereupon the elastic vessel, or its moving part or parts, being again expanded or caused to move outwards, acts upon a mechanical device, such that when the pressure is again taken off, the holder is left free to collapse entirely and close up, thereby cutting off the gas-supply and extinguishing the light.

The chemical ignition of the gas is effected through the operation of the gas pressure or otherwise, by bringing into contact or union suitable chemicals, which by their mutual reaction or combination shall generate the required flame, or spontaneously inflammable gas, whereby the illuminating gas may be ignited. By a modification in some cases the cup or vessel of sealing liquid may be arranged so as to effect suitably the opening and closing as requisite of two nozzles or orifices, one for the gas-supply, and the other to a separate orifice or orifices provided with a combining chamber for the union of the chemicals generating at such orifice a spontaneous and separate gas-flame for effecting the ignition of the gas issuing at the burner from the main. The apparatus for effecting, regulating, and governing the opening and closing of the orifice or orifices for the supply of illuminating gas; as also the devices for effecting chemical ignition, being independent of each other, may be used in conjunction, as above, or either of them separately and apart, in connection or combination with any other suitable, adequate, and effective invention, apparatus or arrangements for effecting the opening of the gas-supply, the ignition of the gas, and the extinction of the gas-lights respectively, as requisite and suitable.—*Iron.*

Cleaning Bottles.—Many persons clean bottles by putting in some small shot and shaking them around. Water dissolves lead to a certain extent, and a film of this lead attaches itself to the sides of the bottle so closely that the shaking or rinsing with water does not detach it, and it remains to be dissolved by any liquid which has the least sourness in it, and if drank, lead poison may be the result; sometimes a shot becomes wedged in at the bottom of a bottle, to be dissolved by wine or cider. Therefore it is better to wash every bottle, as soon as emptied, with warm water and wood ashes, or saleratus, and put the bottles away, mouth open and downward; but be careful to wash again when used, as flies and other insects frequently get into open bottles.—*Manufacturer and Builder.*

Breathing in Rarefied Air.—M. Paul Bert describes in *L'Institut*, a series of experiments made on himself in a receptacle in which the diminution of pressure of air was carried to 25 centimetres—equivalent to an altitude of nearly $1\frac{3}{4}$ miles. He found he could avoid all the ill effects of this diminished pressure by breathing a mixture of 60 p. c. oxygen with atmospheric air. This discovery has already been made trial of by aeronants, who will, by its means, be able to attain heights hitherto impossible.

The Pittsburgh Water Works.

Mr. Lowry, mechanical engineer of the new water works to supply the city of Pittsburgh, has prepared a very full and satisfactory statement of the amount of money required to complete the engines and boilers for the new water works, and the estimated cost of finishing the foundations at Negley's Run. From this statement it will be seen that it will require $93,563 to take the first pair of engines off the hands of the contractor, and $77,295 for the second pair—or $170,858 for both. As there is a very heavy estimate on the second pair for next month, owing to the character of the work done, it is said that perhaps not more than $35,000 could be saved by stopping work on them—even if the city attorney should be of opinion that the work can be stopped at all. As to the boilers, $35,797.56 are required to be paid, making a total of $206,655 to be paid on machinery when placed on the foundations.

The Pittsburgh *Commercial* says:

The above figures are based upon contracts, and are definite. As to the foundations, or pumping works, the estimates show that a total of $310,400 will be required, estimating for but one pumping main to Hiland avenue. Add to the latter figure the amount required to be paid on remainder of work on machinery, and to erect the same, $255,215, and we have a total for this department of $565,615. In this are included the amounts deducted for transportation and erection of the two pairs of engines.

The mechanical engineer, however, can cut down several of these estimates very materially. For instance, he can save on influent pipes 9,000; on bridge over Negley's Run, by dispensing with part of the superstructure, $20,000; and on engine house, by putting up a temporary covering, about $55,000—a total saving of $84,000.

In other words, if we understand the figures correctly, it will take $296,655 to get the machinery out of the hands of the contractors, and an additional sum after cutting down the several items above enumerated, of $226,400, to get the pumping works ready—making in all $433,065. If the engines, boilers, pumping works, etc., were finished up, and the percentages paid, the sum total required would be $726,690. This does not include the estimated cost of the 50-inch pumping main to Brilliant Hill reservoir.

This statement (a copy of which we append below) has no reference whatever to the reservoirs, as that department is under the supervision of Mr. Kennedy, the civil engineer. Under Dr. Gross's resolution, as passed by the water committee at its last meeting, it is proposed to suspend work in the larger compartments of Hiland avenue and Brilliant Hill reservoirs, and to push the smaller compartment of each to speedy completion; and also to suspend work on the second pair of engines and boilers for the same, if, in the opinion of the city attorney, the city has the power under the contracts to suspend.

There seem to be grave doubts as to the power of the city to stop work on the engines and boilers, under the contracts made; but, as the second pair of engines are much nearer completion than was supposed, and as the saving would not exceed $35,000, it is not material to have this work stopped. The city attorney has not yet given his opinion on the matter, and until he does it is useless to speculate further.

There are but $674,000 to the credit of the water extension fund, and, so far as our knowledge extends at present, the work must stop at all points when that shall have been expended. As has been shown, if the engines and boilers must be completed under the terms of the contracts, the machinery and pumping works department will require an outlay of at least $433,000. This will leave but $241,000 to complete the reservoirs! The money to be paid to Wm. Smith on his pipe contract, is put down at $90,000, and the percentages reserved on machinery and reservoirs foot up $228,522, according to the late statement of Mr. Duff, Secretary of the Water Committee. True, these reserves are not to be paid until the work is

tested and found satisfactory, but there ought to be money enough in the Water Extension fund to meet them. That there will not be, is plain enough, from the figures. The danger is, that the committee will go on spending until the fund is exhausted; and after an expenditure of $4,500,000, the water works will be practically useless! "Four and a half millions spent, and no water!" will then be the cry. Let the Councils, and especially the Water Committee, guard against such a contingency as that. We have made the best use that we can of the figures placed at our disposal, and the Councils must devise a plan for avoiding such a calamity as we have foreshadowed, and which is not unlikely to happen unless the Water Committee take a bold and determined stand. The following are the figures in detail:

FIRST PAIR OF ENGINES.

Contract price of first pair of engines	$423,560·00	
Deducted for transportation and erection of machinery.	23,560·00	
Amount allowed contractor for work completed in the shop	400,000·00	
20 per cent. withheld until acceptance of the work	80,000·00	
Required to pay contractor for work done in shop	320,000·00	
Amount paid on work	226,437·00	
Amount yet to be paid for work to be completed in the shop	93,563·00	

SECOND PAIR OF ENGINES.

Contract price of second pair of engines	$375,000·00	
Amount deducted for transportation and erection of machinery	25,000·00	
Amount allowed the contractor for work completed in shop	350,000·00	
20 per cent. withheld until acceptance of the work	70,000·00	
Whole amount to be paid contractor for work completed in shop	280,000·00	
Amount paid the contractors.	205,704·98	
Amount yet to be paid for work to be completed in the shop	77,295·02	
Amount to be paid on first pair	93,563·00	$170,858·02

BOILERS.

Contract for steel and iron boilers	56,377·00	
20 per cent. withheld until acceptance of work	11,075·40	
Required to pay contractor for work completed in shop	44,301·60	
Paid contractors	8,504·04	
To be paid for work completed in shop	35,797·57	
		35,797·56
Amount to be paid on machinery when placed on the foundations		$206,665·58

THE FOUNDATIONS.

Estimated expenditures required to complete foundations	60,000·00	
Estimated cost of 1 pumping main to Hiland avenue reservoir	118,000·00	
Estimated cost of two check valves, two stop gates and branches	8,000·00	
Estimated cost of fire walls of boilers and doors	3,800·00	
Estimated cost of two stacks.	4,600·00	
Estim'd cost of influent pipe.	12,000·00	
Estimated cost of coal track.	4,200·00	
Estim'td cost building bridge over Negley's Run	40,000·00	
Estim'td cost engine house.	60,000·00	
Total		$310,400·00
Required to pay remainer of work on machinery and erect the same	255,215·58	
		565,615·58
20 per cent. retained on engine	150,000·00	
20 per cent. retained on boilers	11,075·40	
		161,075·40
Total		$726,690·98
Estimated cost of 50-inch pumping main to Brilliant Hill reservoir		84,000·00
Total		$810,690·40

—*Iron Age.*

Drainage for Health.

The proper drainage for buildings is a matter of importance. Cellars may be wet, stables not very dry, water may drip from the eaves, cutting holes into the earth and making puddles. The water from such puddles filters directly into the cellar, so that old houses in the country are very frequently dangerous to life on account of the water settling into the cellars. A damp cellar may sometimes be made dry by making a sink in it. Cellars are sometimes made in such wretched places that they need drain-pipes to carry off the water. In arranging any of this kind of work about a stable, it is necessary to be careful that the drainings of the stable do not filter into any water required for domestic use. Water should on no account be allowed to drip from the eaves; it is a great nuisance, undermining foundations and rapidly destroying buildings.

Air confined anywhere, even in a clean room, becomes offensive, probably unhealthy, with a disagreeable smell of closeness, and confined with filth in a drain or sewer, it must be infinitely worse. Drains built tight, with traps, etc., so that there is no ventilation of their interior, generate very poisonous gases, which are ready on the occurrence of any small leak to escape and poison everybody who happens to go near them. The best arrangement for ventilators in houses is to have a separate flue built in the chimney stack expressly to receive the ventilator pipes. Thus the air from the drain is discharged high in the atmosphere in a position to be mixed with smoke; and the noxious properties are destroyed, the smoke, whether of wood or coal, containing about the best chemical disinfectants known.

In all parts of New England hundreds of people are dying every year of typhoid fever. A large tract of the city of Boston is now building on made land, nearly as flat as the prairies about Chicago; and in a few years it will doubtless have to be regraded and re built to get rid of this pestilence. From Maine to Pennsylvania there are flat undrained fields, and wet cellars nearly as bad. All over the country further South, but principally in the Mississippi valley and the flat country bordering the ocean, the half-drained land is infested with intermittent fever and other malarial pestilences to such an extent as to destroy many thousands of people every year; so that, in spite of constant immigration, extensive tracts of country are about as sparsely settled as they were when Pocahontas saved the life of John Smith.—*Dr. Joseph Wilson.*

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☞ In looking for advertisements, see figures 1 to 12, within brackets, at head of advertisement pages.

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WEDNESDAY, SEPTEMBER 2, 1874.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

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SPECIAL EDUCATION IN GAS-SCIENCE.

Among the seed that has already been sown by the way side, there is one whose germination and growth will bear the above fruit. Our observation is to the effect that it has already germinated :—soon will it begin to put forth leaves. Let no one despond, with the thought that it may die out and be lost. This seed is an idea. Ideas, which are not from man, but from a higher source, when once implanted in the mind of man, never die. Their vitality is imperishable; though their growth at first is often slow, especially when the "laborers are few." We believe it time, on our part, as one of those laborers, to do again the little that lies in our power, to bring about the fructification of this idea.

It is long since we pointed out those facts, of undeniable significance, that point to the necessity, in the present stage of civilization, of having a specially trained class of men, to manage that grand art of civilization, of which we are, on this continent, the sole, though unworthy, exponent. In oppidan and urban affairs, the manufacture and distribution of gas for illumination has now in fact become so essential an element, that it is difficult to understand how there ever could have a large town or city—in our present sense of these words—without a gas system. Looking to the future we see looming up in the offing—much nearer than the horizon—and no longer a matter of speculation, except as to the practical details, the requirement, the manufacture and the distribution of gaseous *fuel*, for warming, cooking, and many manufacturing uses.

Those are now living, and will read these words, who will see the time when it will be as difficult for them to picture in their minds and to comprehend how a city—such cities as they will see—could be organized, and furnish health, safety and comfort to their citizens, without gaseous fuel, as now without gas-light. Men who know the present and think of the future, know that within one generation this will come about, and that the foundation is already laid.

Looking, however, altogether at the present, we assert that the want is *now* felt, of more scientific and progressive management of our present gas-works. The gas-profession of America comprises a body of men unsurpassed in intelligence and in adaptation to their calling in life, in every respect except this to which we refer, that is, except in scientific training in the principles that lie at the foundation of their art; the which they lack through no fault of their own, but because there has been no provision for such training so far, in this, or, in fact, in any other country. Special schools are provided for training in other arts of civilization, some of less importance, both present and prospective, to the welfare and comfort of mankind; but owing to a number of circumstances, some of which we have already referred to before, there has been no earnest or united movement as yet, in any country, for technical education in gas-making and management. Let us see whether America cannot, in this at least, lead the nations. It is an art which is in reality in its infancy; and there is thus a congeniality between it and the American nation itself, which is but commencing to realize the future that lies before it. America has been endowed also, probably before all other nations, in the native *materials* for this art.

It may also be asserted, as a solid matter of accomplished demonstration, that in the products of the Gas Retort, we have a prophetic microcosm of the work of future ages, in converting to the use of man the products of nature's forces in the ages past. We would indeed be rash to say what we may *not* yet extract from these products; and it will be safe to say that before long every art of life will be dependent more or less directly or indirectly, upon the products of the gas works. Even the great fundamental art of all—agriculture—as we have before shown, will soon be increasingly dependent upon the ammonia, a now waste product, of our retorts.

To provide the class of young men so trained as to be competent to grasp and grapple with the infinite number and variety of problems that are going to arise out of these things, we must have a school, or schools, which in many points must be organized entirely differently from any yet tried in any country.

It is doubtless too much to expect that any of our great philanthropists, our Cooper, Lawrences, Sheffields, Peabodys, Pardees, Packers, etc., will come forward in this case. The general public mind is not yet sufficiently awakened to this special public need. The consideration of the subject will probably be confined, for some time as yet, to the profession itself. Moreover, such a system of education as is needed must not rest upon any of our present educational foundations. It must not be attached to any of the curricula, or be under the influence of any of the boards of trustees or faculties of our present colleges. The thing needed is so entirely different from, in certain senses *so far beyond*, any of these bodies, that no help or advantage, in fact nothing but embarassment could arise from their co-operation. Our American School of Gas must be under no influences but those identified with the art itself, and the profession which practices it.

GAS-PURIFICATION.

AMERICAN LIME AND IRON METHODS.

In this and the last issue, we reproduce, for the first time in these pages, a report on the above subjects which was made six years since, to the Manhattan Gas Light Company, by the Editor of this Journal. Our objects in taking this step have been chiefly two; first, to put on record some points of gas science brought out for the first time, as we believe, in this report, and to which reference will be made at future times. The other and principal object has been that the Editor might have the opportunity to place himself right, even at this late day, on the record; regarding an important matter, in which he would otherwise remain open to a very reasonable accusation of inconsistency.

In fact, this is the first occasion that has been taken to explain the apparent incompatibility of the frequent advocacy in these columns of the American process of iron-purification of St John and Cartwright, with the apparently sweeping condemnation of iron processes generally, which—as will at once be observed—was inferable from this report. Nevertheless, but few words will be required to make this matter clear; though it is undeniable that these will involve an admission on the part of the Editor, of hasty judgment on one point, arising out of lack of opportunity at the time to examine into *all* the circumstances.

Shortly after the publication of the report, the editor was requested by Mr. St. John to examine the subject more closely; in the belief, on the part of that gentleman, that proper allowance had not been made for the drawbacks under which these new iron methods had labored at the outset, and that injustice had also been done by not taking into account the peculiar and novel devices and materials that were employed. Renewed and thorough examination was made therefore into this part of the subject, this examination being continued, during many months at a large expenditure of time and care. The result was a conclusion that much injustice *had* been done to the merits of the new American method, by classing it indiscriminately with ordinary iron-purification, as practised previously, in Europe, and by not allowing for (indeed at the time *not knowing of*) the practical difficulties that were incident at first to a change of methods in so large an establishment as the New York Gas Works.

While all the conclusions arrived at, in reference to the high superiority of the special modifications of lime purification which were invented for and used by the Manhattan Company, remain unchanged; and the peculiar and ingenious device by which they avert totally the annoyance of effluvia from fouled lime-purifiers, is none the less to be classed among the most valuable triumphs of American genius; yet it has been found that this high and well-merited meed of praise does not involve, with any measure of justice, such comparisons as are drawn in this report to the disparagement of the iron method of St. John and Cartwright, which also, when judged by correct observation and continued experience,

is found to be another advance in the art, deserving to be regarded with pride by the American profession, as having achieved results greatly beyond anything on record with iron methods in Europe.

Hence mainly our desire to reproduce this report, which furnishes occasion to place in a sort of parallelism therewith the comments—amounting, in a measure, as must be admitted, to retractions, or to essential modifications at least—that justice in this case requires.

It is stated in the report that these inventors use a "common limonite ore." Subsequent examination showed this ore to be of a very *uncommon* character, and to have an uncommon adaptability to gas purification, from its granular character, porosity and high degree of purity and hydration. Also that the special mode devised of loosening up the mass and preserving its permeability, by periodical additions of *metallic iron* in fragmental forms, has peculiar merit; as this accomplishes simultaneously an enrichment of the purifying power. In reality, the efficiency of this preparation is so enormous that the general remark quoted from Clegg, as to the "much larger surface" being "requisite than with lime" is absurdly inapplicable; the absolute reverse being true in practice—as we have before shown in these columns—to an extent which is quite surprising.

As to the *odor* evolved in revivification, it was found, on extended and repeated examination, that this was wholly due, at the time this report was drawn up, to a deficiency of power in the *condensing* apparatus of the New York gas company, which led to the absorption by the iron mixture of some offensive matters that should have gone into the tar. Much more powerful condensers having been shortly thereafter brought into use, it was found that no offensive odor was emitted by the iron while revivifying. So convinced did the writer become—on repeated and special examination into this matter—of the fact that the improved condensation has entirely destroyed this important ground of complaint—that he felt fully justified in testifying (in conjunction with Professor Chandler) to that effect in a court of justice, in a case of accusation against the New York company as producers of a public nuisance; of which charge that company was wholly acquitted. It may be added that, on this occasion, it was fully ascertained, to our satisfaction, that the offence complained of, instead of being traceable in any way to the purifying house of that company, was with far greater reason attributable to the same source as that found, and stated in the report, in the case of the Manhattan company—namely the purification of the foul ammoniacal liquor, by other parties; for whom the gas company could not justly be deemed in any way responsible.

One other point remains. The report lays stress upon the general objection to iron purification, that the *carbonic acid*, injurious to the illuminating power, is chiefly left in the gas. It is, however, on the other hand, undeniable that large classes of American gas-coals exist, usually attainable at moderate prices, which are so rich in gas and in candle power that one or two per cent. of carbonic acid is very far from fatal to their use; while at the same time so sulphurous that lime-purification is scarce practicable; and with which the enormous capacity for sulphur of some such preparation as that of St. John and Cartwright is really essential to practical success.

It is reasonable also to consider, in this connection, our increasing facilities of access to enriching coals, cannel, and other materials, which should now enable us, in almost every section of the United States, readily to make up for the small detraction from illuminating power due to incomplete removal of carbonic acid.

We trust therefore that the American gas profession will give more encouragement than hitherto to the patient and enterprising efforts of these inventors, to draw attention to what we believe will be found in numerous cases to be a highly meritorious and advantageous method and material for gas purification.

THE THEORY OF FLAME.

One of the most obscure points in all scientific investigation, among those points whose complete elucidation is essential to our thorough understanding of the Science of Gas, is still that of the nature and structure of flame—a problem which was once supposed to have been entirely unravelled by the famous researches of Sir Humphrey Davy. Recent methods and instruments of research, particularly the polariscope and the spectroscope, have opened so many new points of view that it really seems to be now proved that after all we know little or nothing, with scientific precisison, concerning the familiar apparition called flame. Certainly a number of facts are now well ascertained, which are not to be reconciled with the accepted theories. It is still more embarassing to find also that different observers of repute do not agree as to fundamental facts.

Thus from an authoritative source we learn that experiments by the French chemist Sorel, prove that carbon retains its reflecting capacity even at the highest temperatures. A sunbeam becomes reflected by diffusion and is polarized in exactly the same manner, whether it falls upon a brilliant flame or upon smoke; while, on the other hand, G. A. Hirn has recently set forth, in a French Journal, an extended investigation in which "the first point established was a confirmation of the observations of Arago, that light proceeding from a flame is *not* polarized," drawing the necessary conclusion that the solid particles precipitated in a flame lose, by reason of their incandescence, their reflecting powers. Strangely enough Hirn goes on in this way:

"A large number of experiments proved that a very considerable thickness of gas in a state of combustion arrests relatively only a very small quantity of light, whether the light proceed from the flame itself or from some other source. The common statement, that a flat flame such as that yielded by a fish-tail burner, radiates light equally in every direction, is thereby confirmed." And this in spite of the lack of belief in the popular error referred to in the last sentence, by chemists familiar with gas, and of the fact that this error was positively overthrown some years since in a careful and apparently conclusive series of tests by the London Gas Referees.

Hirn, in this paper, also enounces, and strongly sustains the extraordinary view that—while Davy's theory of luminosity being due to incandescence of solid particles of carbon or other material precipitated in the flame, must be adhered to—such solid particles must become, by virtue of their incandescence, absolutely *transparent* or diaphanous.

This brings to mind the assertion put forward by some one a few years ago, that certain metals—copper, for example, when free from red oxide—are transparent, when in complete fusion; an assertion which has never been verified, or even tested, so far as we know, by experiments made with precision; but which certainly ought to have been so tested

We find Hirn's paper cited and discussed very approvingly by some esteemed contemporaries, but think we have already said enough to show that his facts and arguments certainly require more critical examination. As an illustration of the manner in which an unjustifiable claim to priority of discovery is perpetuated often without full examination into the history of the subject, we may here point out—as we did once before four years since (see this Journal for Aug. 16, 1870, p. 51)—that the claims of Frankland, which have been again conceded in connection with this subject, by several journals (among them the *British Journal of Photography*), to the *first* observation that there are flames of brilliant luminosity that can contain no solid matter, like bisulphide of carbon burning in oxygen; also to the observation that hydrogen under pressure burns with a bright light—that these claims of Frankland are wholly unsubstantial; as Doebereiner, as long ago as November 1831, in the *Bibliotheque Universelle* of Geneva, described both these phenomena in full, and drew from them the same conclusion as Frankland, inimical to the views of Sir Humphrey Davy. In this communication of Doebereiner, so strangely lost sight of (having been copied, as we ascertained, actually into no other scientific publication except Silliman's *American Journal*), nearly all that we as yet know upon the subject of flame was virtually anticipated, except, of course, such new facts as have arisen from observations with the spectroscope. In another article on this subject we shall recur again to Doebereiner, and think we shall be able to show that our boasted advances in this direction have, in forty years, been really almost trifling, and that no subject, of equal importance, calls more loudly for diligent further investigation than that of flame.

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Water Works at Rahway, N. J.

The handsome water works which the city of Rahway has had completed, at comparatively moderate expense, were tested yesterday (August 20th), under pressure, in the presence of many citizens and visitors from Newark, Plainfield, Elizabeth, and other places. The water supply is obtained from the North Rahway river and from a well into which the river water filters. The North Rahway is a clear, beautiful stream, flowing over a pebbly bottom, and overshadowed by wide branching trees, a suburban Juniata. The water is cool and limpid, the river being fed by numberless springs. The water works building was evidently erected more with a view to utility than to beauty. Within its substantial brick walls are two Worthington engines, one of which does the pumping, the other being a reserve. The engine forces the water through about twelve miles of pipe, from four to twelve inches. The pipe is of wrought iron, cement lined, from the foundry of the American Gas and Water Pipe Company.

Since the introduction of water, Rahway has given up its fire engines, retaining only two for use outside water limits. The ordinary pressure is found to be sufficient to send a powerful stream over the highest building in the city. Yesterday, under the management of Chris. Marsh, superintendent of the water works, an extra pressure was put on. Mayor Hyer, of the *Democrat*, City Treasurer Joseph G. Crowell, and their friends, occupied a commanding position outside the range of the coming flood, and within range of a bottle of Capt. Martin's Virginia whiskey. The flood came. The water swept up about 136 feet. Then six streams played at once, thoroughly drenching the roof of the City Hall and a shoemaker's shop. The exhibition was in every way satisfactoby.—*New York Sun.*

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[Reported Expressly for this Journal.]

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Caledonia—At Mines, $2 00, Gold			0 00
Little Glace Bay—At Mines, 1 87½, Gold			2 00
Lingan—At Mines, $2 25, Gold			0 00
Sydney—Old Mine			3 00
" Reserve Mine			2 25
" International			— —
Pennsylvania Coals.			
Penn Gas Coal—At Amboy	$7 00	@	0 00
Westmoreland—At Amboy	7 00	@	0 00
(In New York both the above coals $7 50)			
Shafton	7 50	@	0 00
Youghiogheny	7 75	@	0 00
West Virginia Coals.			
MurphyRun	$7 40	@	0 00
Despard	7 40	@	0 00
West Fairmont	7 40	@	0 00
American Gas Coal	7 40	@	0 00
Fairmont	7 40	@	0 00
Newburgh Orrel	7 40	@	0 00
Pinnickinick	7 40	@	0 00
Cloverhill of Virginia	6 00	@	6 50
McKenzie Compound Mixture			— —
American Cannel Coals.			
Peytona of West Virginia	$12 50	@	00 00
Darlington of Pennsylvania			— —
Cannelton Cannel			12 50
Red Bank—at Philadelphia			7 60
" —at South Amboy			9 00
Asphalts.			
Albertite of New Brunswick	$— 00	@	— 00
Ritchie Mineral of West Virginia	18 00	@	at Balt'e.
Trinidad Bitumen	— —	@	14 05

The Waverly Coal and Coke Company of Pittsburgh, have contracted with the Pittsburgh Gas-Light Co. for 40,000 tons of their Youghiogheny coal, on private terms.

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IN A FLOURISHING TOWN ON THE PACIFIC COAST. A rare opportunity for the purchase of a very desirable property.

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Fire Hydrants,

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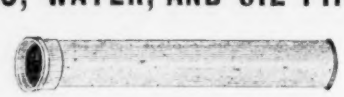

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N. B.—Pipe from 3-inch and upwards cast in 12 ft. lengths.
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Geological Explorations and Reports upon Coal Lands, and other Mineral Properties—Chemical Analyses—Advice and Investigations in all the Chemical Arts—Chemical Inventions and Improvements made.

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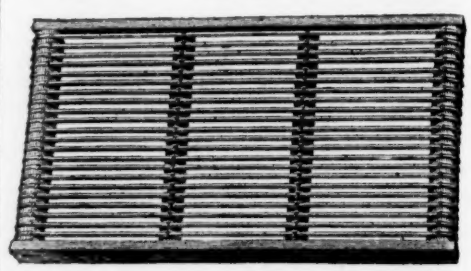

The most satisfactory results ever produced by any device used for supporting slaked lime, for the purpose of purifying coal gas.

6,800 CU. FT. OF GAS PURIFIED PER BUSHEL OF LIME.

These Hurdles combine, as no other device has, *Extreme Porosity*, with Lightness, strength, and durability.

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Gas Light Companies before ordering elsewhere will find it for their interests to give these Lime Hurdles, or supports, their consideration, and a trial will substantiate the above.

We shall deliver for six months, these Lime Hurdles, or supports, to most any point in the United States, free of Freight charges.

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Work warranted perfectly accurate. Send for circular giving price, and directions for ordering.

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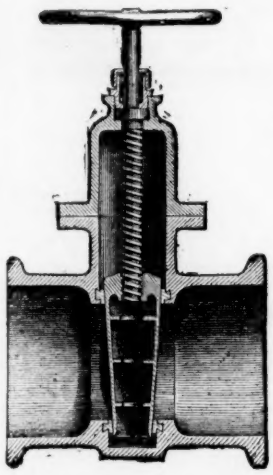

These Valves have been in use for several years, and are pronounced by all who have used them to be

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They afford a direct passage the full size of the pipe. The seats are made of an alloy similar to BABBITT metal, specially prepared for the purpose, and superior to all other metals used for the seats of Gas Valves. It does not corrode under any circumstances to which it is exposed.

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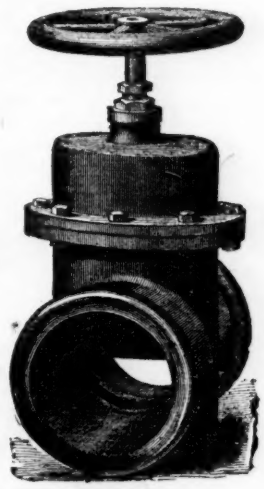

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NEWTON & WATERTOWN GAS-LIGHT CO., WATERTOWN, MASS.
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SOUTH BOSTON GAS-LIGHT COMPANY, BOSTON, MASS.
CHARLESTOWN GAS-LIGHT CO., CHARLESTOWN, MASS.
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GAS AND WATER VALVES ½ INCH TO 36 INCHES DIAMETER.
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Of West Virginia,

Offer to Manufacturers of Gas the pure Cannel Coal from their Colliery at Cannelton, West Virginia. This coal after having been thoroughly tried by the most expert and reliable Engineers, has shown itself to be the most valuable **Enriching agent** produced in this country—a gross ton yielding **10,000** cubic feet of gas, of **61.54** candle power, to purify which, required only two bushels of lime. The yield of coke is **32 bushels** of good quality, quite light, burns freely, making a very hot fire. For further information address

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From West Virginia.

Yields over **13,000** feet of Gas per ton. At ten thousand feet (standard yield) the illuminating power s over **43** candles. Purifies **4,510** feet to the bushel of lime.

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HOISTING ENGINES,
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SECTIONAL PURIFIERS.

The above Patents are the result of many years experien and are of great value, enabling any Company to incr the capacity of its Retort and Purifying Apparatus 15 to per cent without change, and at slight cost.

Plans, Specifications, and Details furnished of all Appar tus, and Companies supplied with every thing required in Gas Manufactura, from the greatest to the least, at the lo est market rates.

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☞ Mr. HAVENS can be consulted on all matters appertaining to Gas and its manufacture, gratis.

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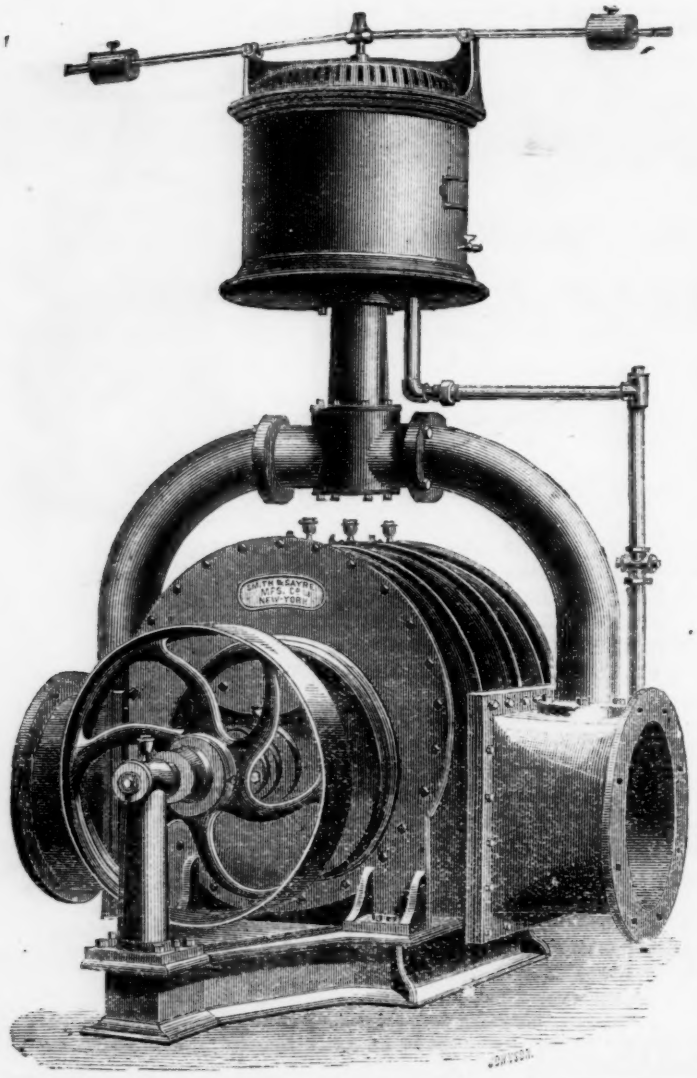
The Mackenzie Patent Gas Exhauster

And Patent Compensator.



They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

are also sole proprietors and manufacturers of the

MACKENZIE PATENT BLOWER, PATENT CUPOLA AND SMELTING FURNACE.

The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary Fan. The Cupolas are manufactured in sizes to melt from 1 to 40 tons per hour, will save one quarter of the time required by the old style Cupola, and 33 per cent fuel. Address

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AMERICAN

GAS SCREEN MAN'F'G COMPANY.

TO GAS-LIGHT COMPANIES.

Your attention is respectfully called to the GAS SCREEN now being manufactured by the American Gas Screen Manufacturing Company, under the patents granted to E. DUFFEE, and are pleased to submit the following points of their excellence and superiority over all other screens now in use.

The Screen is made with an oak frame, interlaced with split rattan, drawn through holes at regular intervals in the Frame and cross-pieces, the edges of the frame being grooved to prevent abrasion.

The advantages of the screen are:

1st. The large purifying surface, the construction of the Screen giving over three-fourths of the surface for the gas to penetrate the lime.

2d. On account of the free passage of the gas through the screen the pressure is reduced, thereby preventing the accumulating of carbon on the retorts.

3d. The saving of lime and labor, as the Screens are not liable to clog, and are easily cleaned.

4th. Their cheapness and simplicity of construction.

5th. Their DURABILITY—they can be used longer than any other now used.

Testimonials.

PROVIDENCE, RHODE ISLAND, March 21st, 1872

E. DUFFFE, Esq., Agent, etc.

Dear Sir: The Trays manufactured by you for our West Station were put in use in September last, and have *given perfect satisfaction.*

The frames are well put together, and I see no reason why hey will not last for a long time. The *very large amount of* pen space in these Trays gives the gas an easy passage, and brings it into contact with the lime much better than when the space is so contracted, as is the case in most of the other Trays in use.

The pressure thrown upon the retorts by contracted passages is very great, and were gauges used more frequently than they now are in many gas-works, this facat of having *open Trays* would become more apparent to mangers of gas works. The digerence in pressure at this station in passing the gas through your purifiers, is two-tenths (2-10) inches.

The amount of gas purified. per bushel of lime used to this date, is six thousand five hundred and fifty six (6,556) cubic feet.

Respectfully yonrs,
JAMES H. ARMINGTON, Supt.

BOSTON GAS-LIGHT CO., Dec. 1871.

Dear Sir: In answer to your inquiry how we like your Patent Tray for dry gas purifiers, I take pleasure in saying we have used them exclusive of all others, for the last three years. and think them far ahead of any yet offered. The surface being nearly three times that of any other Tray, and their lightness and durability perfectly satisfactory.

Yours respedtfully,
A. M. GILES.

EDWARD DUFFEE, Esq.

EAST BOSTON, JUNE 15, 1871.

Gentlemen: We have used your Screens some five years. They give perfect satisfaction.

I consider them *by far the best Screen* for Dry Lime Purifiers I have seen. Yours truly, A. M. NORTON, Supt.

CHELSEA, May 1, 1871.

Mr. E. DUFFEE.

We are using your Purifying Trays, and find them to be the *best of any* that I have used, and will *purify more gas with less pressure* than any tray that I know. I can fully recommend them, after four years trial, to any Gas Superintendent with perfect safety, as the *cheapest and best Tray made.*

Yours truly, JOHN ANDREW, Sup't.

DORCHESTER, March 3. 1870.

Mr. E. DUFFEE.

Dear Sir: We have had your Gas Trays in constant use for almost one year and six months and find them superior to any others we have ever used, both in point of economy and efficiency. Truly yours, W. B. BROOKS,
Agent Dorchester Gas-Light Co.

JAMAICA PLAINS, MASS., June 21, 1871.

EDWARD DUFFEE, ESQ.

Dear Sir; The Trays ordered by this company three years ago, are getting somewhat worn. I wish to say here that I consider your Trays to be superior to any yet invented, therefore please make us another set at the price named, to be like the sample shown in every way, and oblige Yours truly
JAMES F. ROGERS,
Sup't Jamaica Plains Gas-Light Co.

BROOKLINE, June 11, 1871.

E. DUFFEE, ESQ.

Dear Sir: You will please make a set of Gas Trays for this company as soon as convenient, at price named. In regard to the merits of the Tray, after having them in constant use for over two years, I will say that I consider them *superior to any Tray* manufactured in this country. Respectfully yours,
H. A. ALLYN,
Sup't Brookline Gas-Light Co.

BANGOR, August 2, 1870

EDWARD DUFFEE, ESQ.

Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays, I take pleasure in saying that they have been in use over two years, and have given perfect satisfaction and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted. Respectfully yours,
W. H. PERRY, Sup't.

OFFICE OF THE SPRINGFIELD GAS-LIGHT CO.'
SPRINGFIELD, MASS., Oct. 10, 1871.

Mr. WARD,
President Hartford Gas-Light Co.

Dear Sir: I have been using Gas Screens made by the American Gas Screen Company, for nearly a year, and find them superior in every way to the wooden Screens made and formerly used by the Springfield Gas-Light Co. I can purify more gas with the same quantity of lime, there being more surface to the Screens; and I consider them more durable. and recommend them to your consideration.

Yours with great respect,
GEORGE DWIGHT.

ROXBURY, June 14, 1872.

EDW. DUFFEE, ESQ.

Dear Sir: In answer to your inquiry regarding your Patent Gas Screens, I am happy to be able to say, that after nearly three years constant use we are perfectly satisfied with them being able to purify over fifty per cent. more gas with them than with any other Screen we have used.

Yours respectfully,
THOMAS J. PIERCE

OFFICE DETROIT GAS-LIGHT CO.,
DETROIT, MICH., April 22, 1872.

AMERICAN GAS SCREEN MANUFACTURING CO., HAVERHILL.

Gentlemen: The Screens bought of you work far better than any we have ever used. As a proof, we have with the same quantity of lime purified *twenty per cent.* more gas with your Screens than with any others, and the work well done. The workmen are also better pleased with them—they being light and handy to work. They also relieve the pressure very much upon the retorts, and I cheerfully give yau my experience.

Yours truly,
P. E. DEMILL, Secretary.

We give a list of some Gas-Light Companies using them.

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Address R. A. POTTER, Treas.,
Amer. Gas Screen Man'f'g Co., Haverhill, Mass.
EDWARD DUFFEE, Agent.

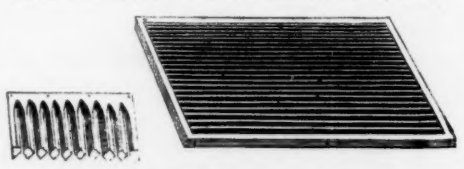
J. L. CHEESMAN.

MANUFACTURER OF

Patent Conically and Diamond Slotted

SOLID WOOD TRAYS.

PATENTED OCTOBER 21, 1862 AND JUNE 10, 1873.



To Gas Companies.

The above Trays will last longer. and are cheaper than any Tray now used. They are now made without any outside strips, which gives more purifying surface, being perfectly smooth. The lime will not adhere to them as in other Trays. They are now used in over three hundred Gas Companies in the United States, and other places.

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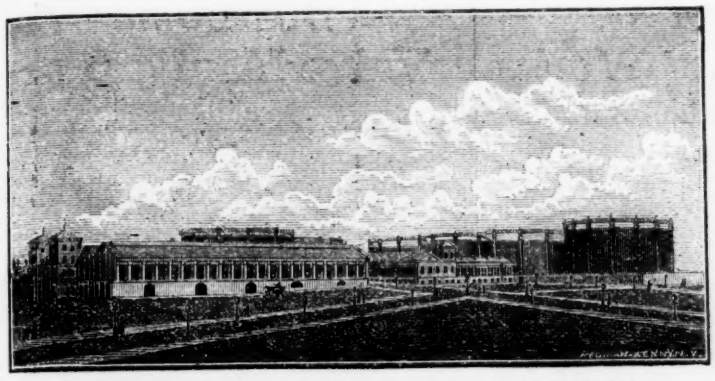
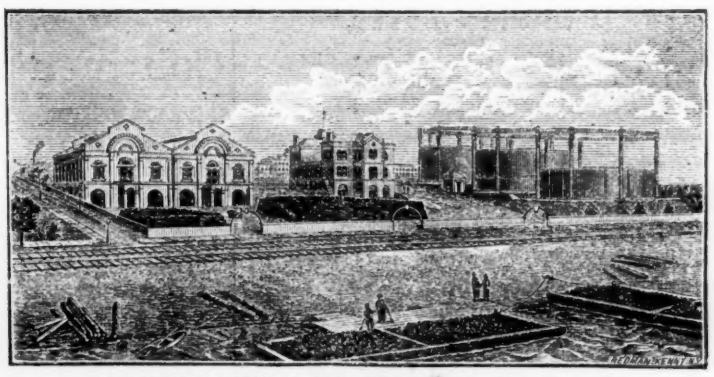
151 and 153 Avenue C, New York.



CINCINNATI GAS WORKS, ERECTED 1871-72-73.—WM. FARMER, ENG.



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ARCHITECT AND GENERAL GAS ENGINEER,

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WILLIAM FARMER may be consulted upon all matters connected with the construction of GAS WORKS, or any other description of buildings Will furnish General and Detail Drawings, Specifications and Estimates for Gas Works of any capacity.

PATENTEE OF THE FOLLOWING INVENTIONS:

Exhausters for Gas and Foul Lime Ventilation,
Dumping Barrows for Coal, Coke and Lime,
Hydraulic Mains for Retort Benches,
Blowers for Forges, Foundries, &c.
Pumps for Water, &c., &c.

REFERENCES:

Professor SILLIMAN, New Haven, Conn.
GEN. CHAS. ROOME, President Manhattan Gas-Light Company, N. Y.
A. W. BENSON, President Brooklyn Gas-Light Company, Brooklyn, N. Y.
W. W. SCARBOROUGH, President Cincinnati Gas-Light Company, Cincinnati, Ohio.
S. L. HUSTED, President Laclede Gas-Light Company, St. Louis, Mo.
Prof. HENRY WURTZ, Editor AMERICAN GAS-LIGHT JOURNAL, N. Y.
GEN. A. HICKENLOOPER, Vice-President Cincinnati Gas-Light Co., Cincinnati, Ohio
FREDERICK CROMWELL, Vice-President Laclede Gas-Light Company, St. Louis Mo.
C. VANDERVOORT SMITH, Engineer Manhattan Gas-Light Company, N. Y.
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GAS PURIFICATION.

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Has purified, per bushel, on a single test, 10,000 feet of Westmoreland Gas. With revivification lasts indefinitely. Surpasses in POWER and ECONOMY all known materials. Saves largely in FIRST COST, SPACE, LABOR, SUPERINTENDENCE, and all current expenses. Will purify *easily* sulphurous gas, wholly *unmanageable by lime.* Takes out *all the ammonia.* Now operating in the following Gas Works: Harlem, New York (21st street); Port Morris; Hunter's Point; East New York Worcester, Lynn and Cambridge, Mass.; Lewiston, Maine; St, Albans, Vt.; Pawtucket, R. I.; Meriden, Ct.; and being introduced in many other places.

Cost 70 cents per bushel. One bushel for each square foot of Purifier sufficient. Rights to use for life of Patents, for daily makes of gas in thousands; under 25,000 $200; under 50,000, $400; under 100,000, $500; $250 additional for each additional 50,000 per day.

For further information and instructions, apply to
ST. JOHN & CARTWRIGHT,
21st Street and Avenue A, New York Gas Works.

☞ Immediate arrangements are urged, as the demand for the prepared composition is increasing *so rapidly* that delays in supply may occur.

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Cast Iron Pipes and Fittings,

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Gas and Water Mains.

All sizes from 3 to 30 inch cast vertically in 12½ feet lengths

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OHIO GAS CANNEL,
From the Sterling Colliery.

We are now prepared to place in the market, through our agents as below, a regular and unlimited supply of this valuable Cannel, for gas purposes. The analysis made in 1871 by Prof. WURTZ, Editor of this Journal, at the Laboratories of the NEW YORK GAS-LIGHT COMPANY, gave 47½ per cent of Volatile Matter and 45 bushels to the ton of a fair quality of coke. The yield of gas was at the rate of 9,500 feet per ton of about 27 candle power. It is not highly sulphurous, can be purified by Lime, and the ash from the coke does not clinker. The above test has been fully substantiated as correct, and can confidently recommend trial of the coal.

TUTTLE & GIRTY Proprietors,
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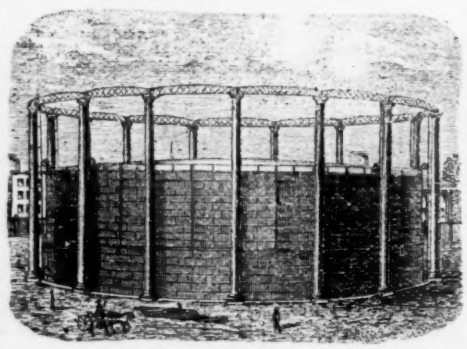

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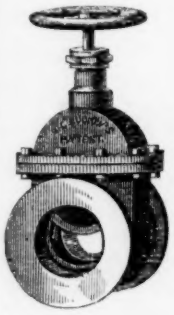

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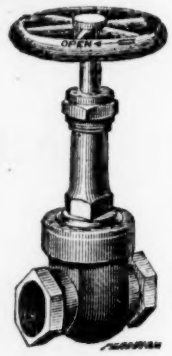

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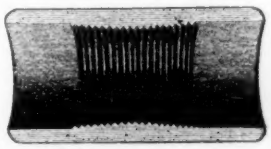

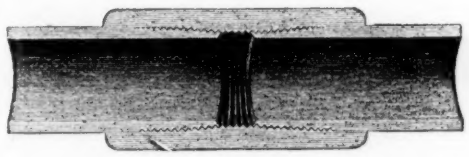

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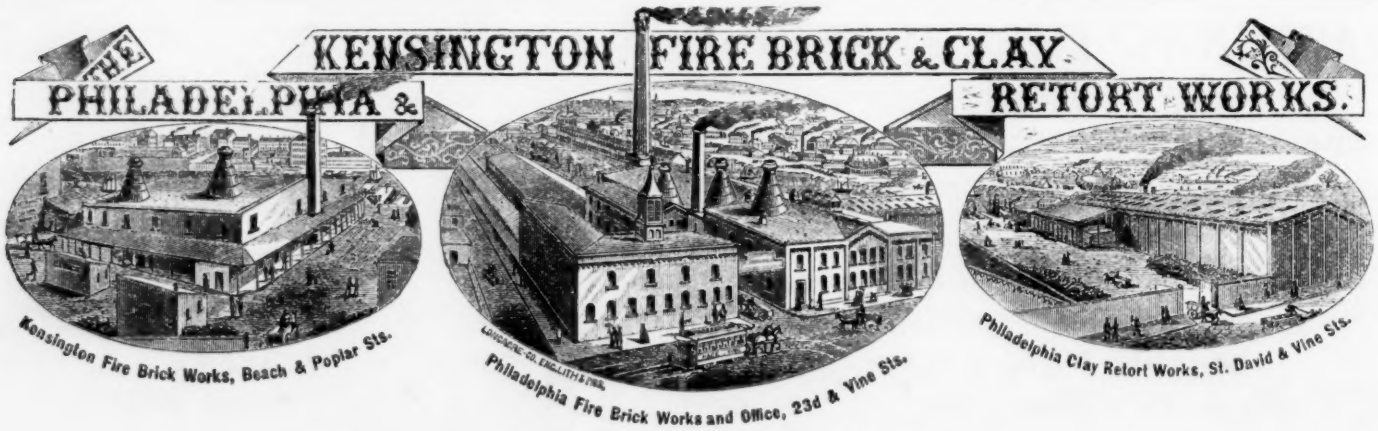
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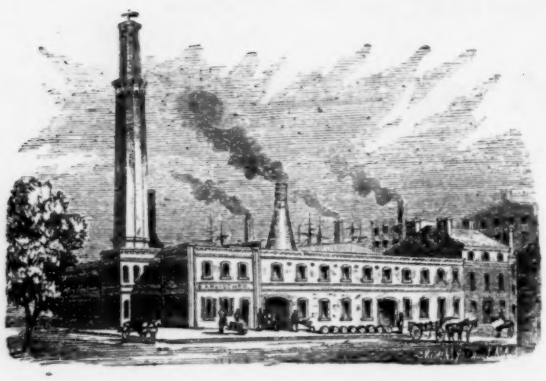

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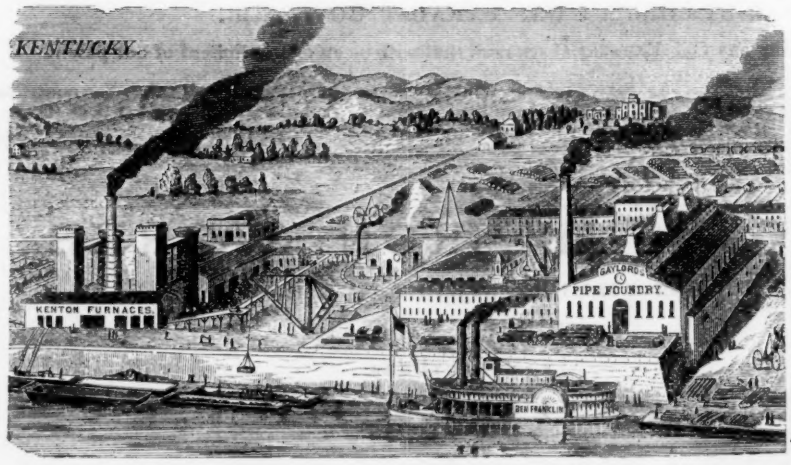

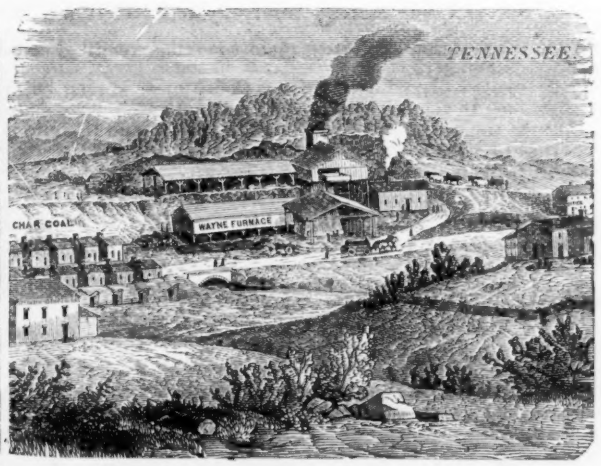

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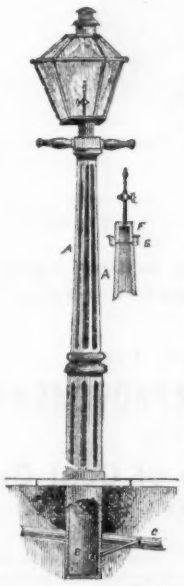

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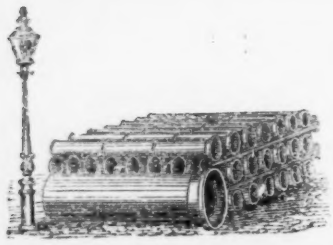

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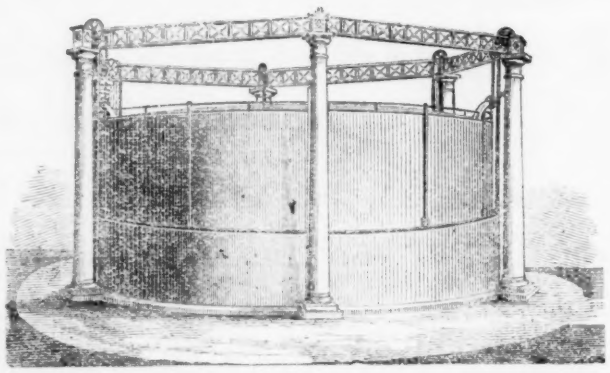

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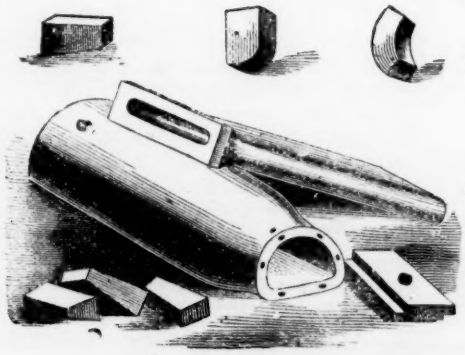

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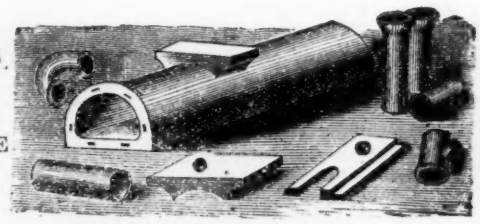

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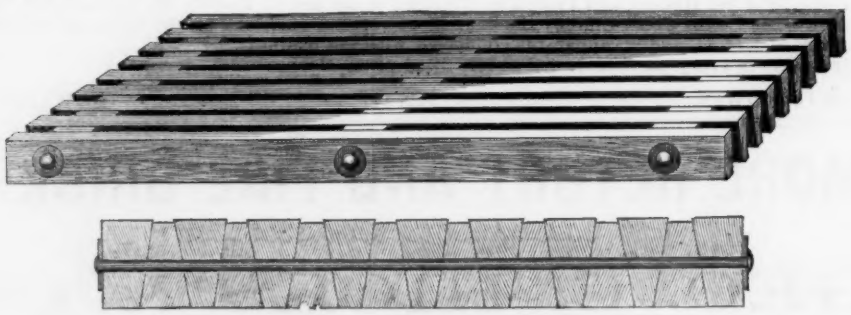

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